deposition analysis, combining the peak year project-specific modeling results with the measured values at Wind Cave National Park, and comparing these to the critical load, provides another type of cumulative impacts assessment. All of the combined acid deposition results are below the critical load.

For information purposes, NRC staff has also presented the impact analyses using the PM_{10} modeling results that do not implement the AERMOD dry depletion option (i.e., the initial modeling run) and the staff has included the PM_{10} emissions in the CALPUFF visibility analysis. The NRC staff conclude in SEIS Section 4.7.1 that for analysis under these modeling assumptions and without additional considerations, the proposed Dewey-Burdock ISR Project will have a LARGE effect on air quality. As stated preveiously, NRC staff determined that the impact on air quality within the study area resulting from other past, present, and reasonably foreseeable future actions is MODERATE. When combining the Dewey-Burdock impacts with all other impacts from other past, present, and reasonably foreseeable future actions in the study area, NRC staff conclude that the overall cumulative impact will be LARGE.

5.7.2 Global Climate Change and Greenhouse Gas Emissions

NRC staff determined that a meaningful approach to address the cumulative impacts of greenhouse gas emissions, including carbon dioxide, is to recognize that (i) such emissions contribute to climate change, (ii) climate change is best characterized as the result of numerous and varied sources, each of which might seem to make a relatively small addition to global atmospheric greenhouse gas (GHG) concentrations, (iii) carbon footprint is a relevant factor in evaluating potential impacts of an alternative, and (iv) analysis may include both the proposed action's contribution to atmospheric GHG levels and the potential effects of climate change to the proposed action. These concepts are more fully developed in Sutley (2010).

GHG emissions are described in SEIS Sections 2.1.1.1.6.1.1, 3.7.2, and 4.7. As described in SEIS Section 4.7.1.1.2, the operation phase emissions bound the other phases in terms of carbon dioxide levels generated. However, the peak year carbon dioxide annual emission estimate (when all four phases occur simultaneously) of 38,621 metric tons [42,572 short tons] represents the highest amount of emissions the proposed action will generate in any one project year (see Table 2.1-6). Electrical consumption is the source that generates the most emissions followed by mobile sources and then the stationary sources. The mobile sources include equipment associated with the drilling activity with the primary contributor being the drill rig (IML, 2013). As described throughout SEIS Section 4.7.1.2, NRC staff do not expect to see any appreciable difference in the overall greenhouse gas emission levels between the land disposal option and the deep well disposal option.

As described in SEIS Section 3.7.2, South Dakota accounted for approximately 36.5 million metric tons [40.2 short tons] of gross carbon dioxide equivalent (CO_2e) emissions in 2005 and forecast levels of 39.1 and 46.6 million metric tons [43.1 and 51.4 short tons] in 2010 and 2020, respectively (Center for Climate Strategies, 2007). The 2005 total is reduced to 34.9 million metric tons [38.5 short tons] as a result of annual sequestration (removal) due to forestry and other land uses (Center for Climate Strategies, 2007). The proposed Dewey-Burdock ISR Project peak year emission estimate of 38,621 metric tons [42,572 short tons] equates to less than 1 percent (0.11 percent) of the overall GHG emissions for South Dakota in 2005. The low level of GHG emissions from the proposed Dewey-Burdock Project relative to the state estimates provides the basis for the NRC staff conclusion that the proposed Dewey-Burdock ISR Project would have a SMALL incremental impact on air quality in terms of GHG emissions

when added to the MODERATE cumulative impacts anticipated from other GHG emissions from past, present, and reasonably foreseeable future actions.

NRC also examined the potential effect of climate change on the proposed Dewey-Burdock ISR Project. While there is general agreement in the scientific community that some climate change is occurring, considerable uncertainty remains in the magnitude and direction of some of the changes, especially predicting trends in a specific geographic location. As described in SEIS Section 3.7.2, the recent report from the U.S. Global Change Research Program (GCRP) served as a source for climate change information (GCRP, 2009). From 1993 to 2008, the average temperature in the Great Plains increased by approximately 0.83 °C [1.5 °F] compared to the 1961 to 1979 baseline. South Dakota and the proposed Dewey-Burdock site are considered part of the Great Plains in this study. From 2010 to 2029, the average temperature in the Great Plains is projected to increase approximately 1.7 °C [3 °F] relative to the 1961 to 1979 baseline. Although GCRP did not incrementally forecast a change in precipitation by decade, it did project a change in spring precipitation from the baseline period (1961 to 1979) to the next century (2080 to 2099). For the region of South Dakota where the proposed Dewey-Burdock ISR Project would be located, GCRP forecasted a 10 to 15 percent increase in spring precipitation (GCRP, 2009).

Based on the previous analyses, the overall effect of projected climate change on the proposed Dewey-Burdock ISR Project is SMALL. The predicted increases in temperature and precipitation over the project lifespan are small. Much of the activity associated with ISR milling occurs below ground, whereas the listed climate change parameters are associated with the surficial and atmospheric environments. The predicted increase in precipitation and subsequent infiltration into the groundwater could result in an increase in recharge to the aquifer in the future. This could affect the proposed project by increasing the volume of groundwater in the orebody and improving the effectiveness of the aquifer restoration process. Similarly, potential changes to the site environment and resources, such as ecology during the period when the proposed activities would be conducted, would not be sufficient to alter the environmental conditions at the proposed site in a manner that would change the magnitude of the environmental impacts from what has already been evaluated in this SEIS.

5.8 Noise

Cumulative impacts from noise were assessed within an 8-km [5-mi] radius of the proposed Dewey-Burdock ISR Project. This area served as the cumulative assessment geographic boundary and was chosen because noise dissipates quickly from the source. GEIS Section 4.4.7 stated that sound levels as high as 132 dBA will taper to the lower limit of human hearing (20 dBA) at a distance of 6 km [3.7 mi] in this region, so a larger 8-km [5-mi] study area will be appropriate to evaluate potential cumulative impacts on noise (NRC, 2009a). The timeframe for the analysis is 2009 to 2030 (see SEIS Section 5.1.2 for the estimated operating life of the facility).

Noise associated with the proposed Dewey-Burdock ISR Project includes the operation of equipment such as trucks, bulldozers, and compressors; traffic due to commuting workers or material/waste shipments; and wellfield, central processing plant, and satellite facility activities and equipment. Other noises would include traffic noise from nearby roads and railroads. As detailed in SEIS Section 4.8.1, noise impacts to onsite and offsite residential and wildlife receptors and onsite workers from ISR activities at the proposed project would be SMALL for all stages of the project lifecycle.